

In the Claims

1. (Currently Amended) A composite thermal transfer membrane, comprising of a thin polymer membrane that insulate a heat transfer material therewith a plurality of through holes in a predetermined pattern a flexible polymer membrane that is capable of having a thickness equal to or less than 100 μ m having predetermined heat transfer and electrical insulating properties, with the polymer membrane having a plurality of through-openings disposed therein and the through-openings having predetermined shapes, and with the polymer membrane being capable of being disposed between a heat receiving device and a heat generating device that have non-planar surface areas and conforming to the non-planar surface shapes; and

thermal transfer material having thermal condition and insulating material filling a predetermined pattern of at least a hole to provide increased thermal conductivity to the thermal membrane properties, with the thermal transfer material being disposed in the through-openings of the polymer membrane and being flexible with the polymer membrane, the thermal transfer material having heat transfer properties such that the thermal transfer material will transfer heat per surface unit area at a rate greater than the polymer membrane.

2. (New) The composite thermal transfer membrane as recited in claim 1, wherein the polymer membrane includes poly (dimethoxysilane) (PDMS) admixed with a conductive material.

3. (New) The composite thermal transfer membrane as recited in claim 2, wherein the conductive material includes alumina.

4. (New) The composite thermal transfer membrane as recited in claim 2, wherein the conductive material includes zinc oxide.

5. (New) The composite thermal transfer membrane as recited in claim 2, wherein the conductive material includes alumina nitride.

6. (New) The composite thermal transfer membrane as recited in claim 1, wherein the thermal transfer material fills a predetermined portion of the through-openings.

7. (New) The composite thermal transfer membrane as recited in claim 6, wherein the thermal transfer material fills a portion of the through-openings to a predetermined thickness.

8. (New) The composite thermal transfer membrane as recited in claim 7, wherein the thermal transfer material fills the through-openings in a range from a layer of thermal transfer material on the interior wall of the through-openings to completely filling the through-openings.

9. (New) The composite thermal transfer membrane as recited in claim 8, wherein the plurality through-openings are capable of having at least two having different thicknesses of thermal transfer material.

10. (New) The composite thermal transfer membrane as recited in claim 1, wherein the through-openings include being arranged in a predetermined pattern.